5. (Cancelled).

6. (Once Amended) The method, as recited in claim [5] 4, wherein the fluorocarbon has a flow rate, wherein the flow rate of the fluorocarbon is between 0.5 sccm and 50 sccm.

7. (Cancelled).

8. (Once Amended) The method, as recited in claim [7] 1, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas, H_2 gas, and N_2 gas.

9. (Once Amended) The method, as recited in claim [7] 1, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas and NH_3 gas.

10. (Once Amended) The method, as recited in claim [7] 1, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas, O_2 gas, and N_2 gas.

REMARKS

Claims 5 and 7 have been cancelled. Claims 1, 2, 6, and 8-10 have been amended.

The applicants affirm the election of claims 1-14.

The Examiner objected to the specification stating that the incorporation by reference of the patent applications is improper, since such applications are not allowed applications. The applicants request a citation of a rule that does not allow incorporation by references of applications.

The Examiner rejected claims 3, 5, and 7 under 35 U.S.C. § 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as the invention. Regarding claim 3, the Examiner suggests a corrected phrasing. Claim 3 has been amended accordingly. Regarding claims 5 and 7, the Examiner stated that, where the trademark/trade name SiLK is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with 35 U.S.C. § 112. Claim 1 has been amended to include the limitation of claims 5 and 7. To comply with the Examiner's objection, SiLK has been generically described as "silicon-free low-k dielectric

layer". This is supported by page 2, lines 20-21, of the application that describes SiLK as silicon-free BCB. Since claim 1 has been amended to incorporate the limitations of claims 5 and 7, claims 5 and 7 have been cancelled.

The Examiner rejected claim 1 under 35 U.S.C. § 102(e) as being anticipated by Tao et al (US 6,194,128B1 hereinafter Tao). Claim 1 has been amended, incorporating the limitations of claims 5 and 7, wherein SiLK has been defined as "silicon-free low-k dielectric layer" to meet the Examiner's 35 U.S.C. § 112 rejection. Since Tao does not disclose the etching of a silicon-free low-k dielectric layer, for at least this reason, Tao does not anticipate claim 1, as amended.

The Examiner rejected claims 2-14 under 35 U.S.C. § 103(a) as being unpatentable over Tao in view of Ye et al. (US 6,080,529 hereinafter Ye).

It would not be obvious to combine the teachings of Tao and Ye to obtain the limitations recited in claim 1, as amended to incorporate the limitations of claims 5 and 7. SiLK as described on page 2, lines 20-21, and recited in claim 1 is a silicon-free low-k dielectric material. Tao teaches using a fluorine-containing etchant gas to etch low-K dielectric materials that are not silicon free, such as FLARE and PAE-II. The fluorine in the etchant gas is useful for etching dielectric layers of silicon. It is not obvious that fluorine in the etchant gas is useful for etching silicon-free low-K dielectric materials, such as SiLK. Ye in column 23, lines 5 to 18, states that an above-described etch chemistry for a low-K etch would be useful for etching SiLK. The etch chemistry previously described in Ye for etching a low-K dielectric layer is disclosed in column 22, lines 40 to 48. The etchant gas is NH_3. Although Ye, in column 22, lines 1-5 teaches using a fluorine-containing etchant gas to etch a silicon dioxide layer, fluorine is not described as being in the etchant gas for the low-K dielectric layer. Therefore, neither Tao nor Ye, separately or together, suggest etching a silicon-free low-K dielectric layer, such as SiLK, with a fluorine-containing etchant gas. For at least these reasons, claim 1, as amended, is not made obvious by Tao in view of Ye.

Claims 2-4, 6, and 8-14 each depend either directly or indirectly from the independent claim 1, and are therefore respectfully submitted to be patentable over the art of record for at least the reasons set forth above with respect to claim 1. Additionally, these dependent claims require additional elements that, when taken in the context of the claimed invention, further patentably distinguish the art of record. For example, claims 10 and 14 recite that the fluorocarbon-containing etchant gas comprises CH_3F gas, O_2 gas, and N_2 gas. The references do

not disclose or make obvious this etchant gas combination for etching a silicon-free low-K dielectric. These additional elements are not made obvious by the cited references. For at least these reasons, claims 2-4, 6, and 8-14 are not made obvious by Tao in view of Ye.

Applicants believe that all pending claims, as amended, are allowable and respectfully request a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at telephone number (831) 655-2300.

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP

Michael Lee

Michael Lee
Reg. No. 31,846

P.O. Box 778
Berkeley, CA 94704-0778
(831) 655-2300

CLEAN VERSION OF PENDING CLAIMS

1. (Once Amended) A method for etching a feature in an integrated circuit wafer, the wafer incorporating at least one silicon-free low-k dielectric layer, the method comprising:
disposing the wafer within a reaction chamber;
introducing a flow of fluorocarbon-containing etchant gas into the reaction chamber;
forming a plasma from the etchant gas within the reaction chamber; and
etching the feature in at least a portion of the silicon-free low-k dielectric layer.

A1

2. (Once Amended) The method, as recited in claim 1, wherein the silicon-free low-k dielectric layer is an organic silicon-free benzocyclobutene low-k dielectric layer.

3. (Once Amended) The method, as recited in claim 2, wherein the fluorocarbon is selected from [a] the group consisting of CH_3F, CH_2F_2, and CHF_3.

4. The method, as recited in claim 3, wherein the fluorocarbon-containing etchant gas further contains additives selected from the group consisting of oxygen, hydrogen, nitrogen, and ammonia.

5. (Cancelled).

A2

6. (Once Amended) The method, as recited in claim 4, wherein the fluorocarbon has a flow rate, wherein the flow rate of the fluorocarbon is between 0.5 sccm and 50 sccm.

7. (Cancelled).

8. (Once Amended) The method, as recited in claim 1, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas, H_2 gas, and N_2 gas.

9. (Once Amended) The method, as recited in claim 1, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas and NH_3 gas.

A3

10. (Once Amended) The method, as recited in claim 1, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas, O_2 gas, and N_2 gas.

11. The method, as recited in claim 5, wherein the fluorocarbon has a flow rate, wherein the flow rate of the fluorocarbon is between 0.5 sccm and 50 sccm.

12. The method, as recited in claim 2, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas, H_2 gas, and N_2 gas.

13. The method, as recited in claim 2, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas and NH_3 gas.

14. The method, as recited in claim 2, wherein the fluorocarbon-containing etchant gas comprises CH_3F gas, O_2 gas, and N_2 gas.

15. An integrated circuit on a wafer, wherein the integrated circuit has a feature formed in at least one low-k dielectric layer, wherein the feature is etched by the method, comprising:

disposing the wafer within a reaction chamber;

striking a plasma within the reaction chamber;

introducing a flow of fluorocarbon-containing etchant gas into the reaction chamber; and

with the plasma and the etchant gas in operative combination, etching the feature in at least a portion of the low-k dielectric layer.

16. The integrated circuit, as recited in claim 15, wherein the low-k dielectric layer is an organic low-k dielectric layer.

17. The integrated circuit, as recited in claim 16, wherein the fluorocarbon is selected from a group consisting of CH_3F, CH_2F_2, and CHF_3.

18. The integrated circuit, as recited in claim 17, wherein the fluorocarbon-containing etchant gas further contains additives selected from the group consisting of oxygen, hydrogen, nitrogen, and ammonia.